AGENDA ITEM B-01

CITY OF LODI
COUNCIL COMMUNICATION

AGENDA TITLE: **Surface Water Treatment Facility Conceptual Design and Plant Feasibility Evaluation**

MEETING DATE: **July 1, 2008 (Shirtsleeve Session)**

PREPARED BY: **Public Works Director**

RECOMMENDED ACTION: Receive information regarding the attached Surface Water Treatment Facility Conceptual Design and Plant Feasibility Evaluation

BACKGROUND INFORMATION: On June 21, 2006, City Council voted to the employ direct use of the City's Woodbridge Irrigation District (WID) annual 6,000 acre-feet contractual allotment. Direct use involves the treatment, disinfection and distribution of water through the City's water distribution system.

Council awarded a consultant services contract to HDR, Inc. of Folsom on April 4, 2007 to prepare the Surface Water Treatment Facility Conceptual Design and Feasibility Evaluation. As part of the feasibility evaluation, Council was requested to select a preferred site on September 5, 2007. Of the options presented, Council preliminarily identified the 13-acre parcel westerly of Lodi Lake as the preferred site. This site selection preference was supported by the Parks and Recreation Commission. After further study, Staff returned to Council on October 17, 2007, regarding the use of the General Mills property and provided information that General Mills could not support use of the property for a water treatment plan. At this time, the City Council made a final site selection decision and concurred with staff that a membrane filter system was the best technology for use at this facility.

The conceptual design and feasibility evaluation work has been completed and is presented in the attached Summary Report. Several important assumptions imbedded in the analysis are presented below.

1. Filter Membrane technology with chlorine disinfection is the main treatment system.
2. The water plant is sized to treat 6,000 acre-feet per year with 5,000 acre-feet treated during the period March 1 through October 15 and 1,000 acre-feet treated during the remainder of the year.
3. The site for the water plant is the City-owned 13-acre parcel adjacent to Lodi Lake.
4. Provisions for future expansion of the facilities are included.

The goals of the Surface Water Treatment Facility Conceptual Design and Feasibility Evaluation included:

1. Evaluating several alternative sites
2. Developing preliminary design criteria for the plant site, treatment facilities, modifications to existing facilities and ultimate expansion to fully utilize surface water supplies.

APPROVED: _____
Blair King, City Manager

3. Establishing an implementation plan culminating in construction of the first phase of the project.

Recommended action items for the project and timelines for completion are summarized below.

1. Conduct surface water sampling monthly for 24 months to comply with regulations.
2. Prepare the watershed sanitary survey in compliance with the Surface Water Treatment Rule within the next 6 months.
3. Prepare the preliminary design report that will further refine the plant design and cost estimates and that will provide the project description for CEQA evaluation.

FISCAL IMPACT: The costs for the recommended action items will be approximately $500,000. Future approval by the City Council will be requested before moving forward on the project.

FUNDING AVAILABLE:

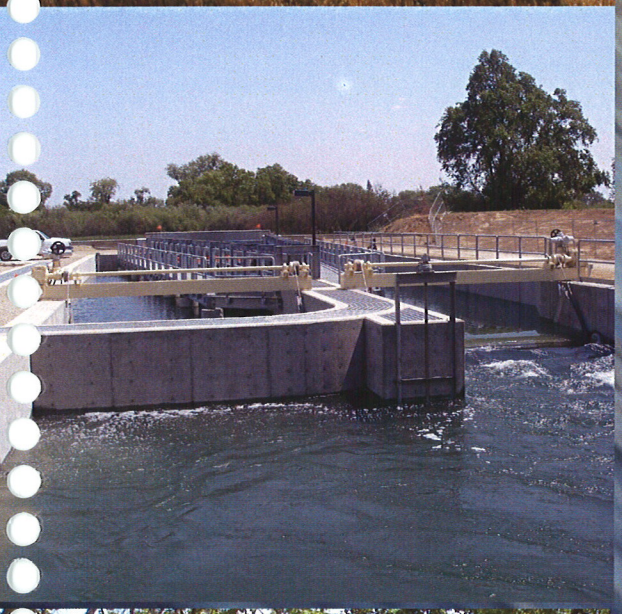
_____
Kirk Evans, Budget Manager

_____
F. Wally Sandelin
Public Works Director

FWS/pmf

Attachments

cc: Kirk Evans



City of Lodi

Surface Water Treatment Facility Conceptual Design

May 2008

HDR

ONE COMPANY
Many Solutions®

Surface Water Treatment Facility

Conceptual Design and Feasibility Evaluation

CITY OF LODI

Administrative Draft

May 2008

Prepared under the responsible charge of

Richard Stratton, Project Manager
Registration Number 37261

HDR

2365 Iron Point Road, Suite 300
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In Association with West Yost Associates

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SUMMARY REPORT

City of Lodi Surface Water Treatment Facility Conceptual Design and Feasibility Evaluation

Introduction

Project Goals and Report Preparation Approach

The goals of the Surface Water Treatment Facility (SWTF) conceptual design and feasibility evaluation include:

- Evaluating five alternative sites, including a fatal flaw analysis, to select a preferred site for the SWTF. The evaluation should consider criteria including sufficient available size, flooding hazards, environmental issues, pipeline costs to reach the site, site improvements costs, other potential benefits of the site, and aesthetic compatibility with surrounding land uses including access.
- Developing preliminary design criteria for the proposed SWTF and other needed improvements including pipelines and well improvements, comparing membrane and conventional filtration, and determining the estimated capital and operating costs of the overall project. The design criteria should include an analysis of the needed capacity of the SWTF in order to fully utilize the purchased water.
- Establishing an implementation plan and schedule for completing the preliminary design, environmental documentation, final design, and the phased construction of the project.

The approach to preparing and finalizing the report involves a logical sequence of first evaluating the sites and selecting a tentative best site for the SWTF. This is followed by selecting the preferred treatment process and developing a conceptual design and preliminary costs. Based on the conceptual design, the best apparent site is reconfirmed. Financing options for the project were to be developed as part of the feasibility evaluation, but instead will be addressed in a future study after the actual project costs and potential funding sources are better defined. The information developed in this report can be used by the City to decide between the options of treating, selling, utilizing raw water for non-potable uses, or developing plans to otherwise use the water that cannot be banked.

Background

Existing Water System

The City currently utilizes groundwater as its sole source of supply. The City's existing water distribution system is a grid network of 6, 8, 10, 12 and 14-inch diameter mains, two water

storage tanks, and a total of 27 groundwater wells spaced at half-mile intervals throughout the City. The capacity of the wells ranges from 1.2 to 3.0 million gallons per day (mgd) and the total capacity of the 26 existing wells and 2 planned wells is 54 mgd. Among the 28 existing and planned wells, only 14 wells currently have standby chlorination equipment. The groundwater is normally not chlorinated in the distribution system. The City is approximately 12-square miles in size and is bordered on the north by the Mokelumne River and on the west by the WID South Main Canal and Lower Sacramento Road. The topography is flat valley floor that slopes gently to the southwest. Starting at the Mokelumne River at elevation 55, the land falls to elevation 26 at the southwest corner over a distance of approximately 6-miles.

Projected Water Demands and Sources of Supply

Projected Water Demands

The City's Urban Water Management Plan (UWMP) projected the City's total future demand based on an average increase rate of 1.5 percent over the recorded 2004 demand of 17,011 AFY (15.2 mgd). Average annual potable water demands are expected to increase to 25,100 AFY (22.4 mgd) by 2030. With 15 percent residential user conservation, the future demand is anticipated to be reduced to 21,300 AFY (19 mgd).

Current and Projected Water Supply

The City has historically used from 11,462 AFY of groundwater in 1970 to 17,011 AFY used in 2004. Historical data indicate that the City's groundwater elevation decreased on average 0.39 feet per year from 1927 to 2004, although groundwater elevation also fluctuates due to annual rainfall. Historical groundwater elevation and annual rainfall are presented in Figure 1. This figure indicates that the groundwater basin underlying Eastern San Joaquin County that supplies the City's wells is in an overdraft condition. The 2005 UWMP estimates that the safe yield of the underling groundwater basin is approximately 15,000 AFY on an acreage-based relationship. The declining groundwater basin is a result of groundwater extraction by all groundwater users in the area, including other cities, agriculture, private well owners, and the City.

The City plans to reduce its groundwater pumping in the long term as part of a regional effort to stabilize the groundwater basin. To achieve this goal, the City of Lodi entered into a purchase contract with Woodbridge Irrigation District (WID) in October 2003 and began purchasing 6,000 acre-feet per year (AFY) of WID's pre-1914 Mokelumne River water entitlement. The purchase is intended to supplement the City's water supply to meet long term water demands and to reduce the City's dependence on the groundwater aquifer. The City evaluated alternatives for utilizing the purchased water including recharge in spreading basins and construction of a surface water conveyance and treatment system to allow for direct use by current and future users.

The UWMP projected the future water supply will include groundwater, surface water, and recycled wastewater. The projected groundwater supply will be 15,000 AFY from now until year 2030, based on an estimated safe yield of the groundwater basin serving the City. The projected surface supply is 6,000 AFY from now until year 2043 based on a contract with WID.

Potentially an additional 7,000 AFY could be secured after that based on the formula of 3 AF of water for each acre of City land within the WID service area converted from agricultural to municipal/industrial uses. The projected recycled water supply is 10,380 AFY in 2030 based on the UWMP.

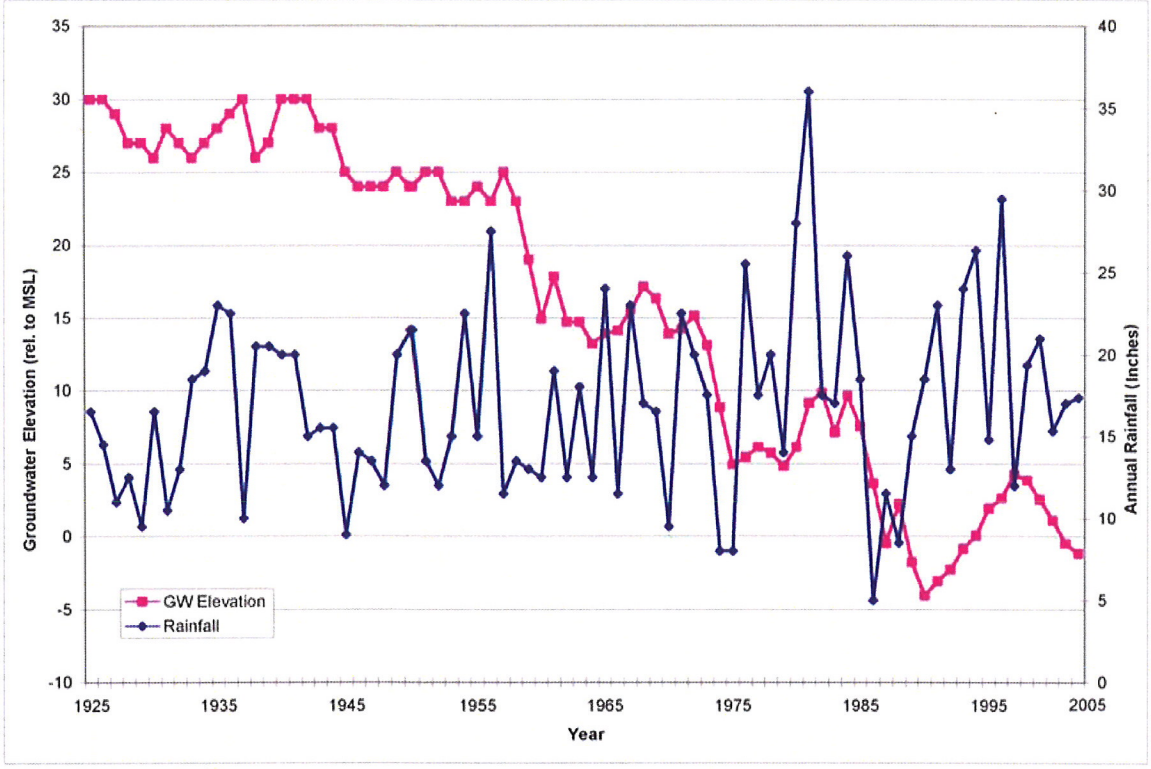


Figure 1. Historical groundwater elevation and annual rainfall

Improvements to the WID water delivery system funded in part by the City's water purchase include construction of an inflatable dam to raise the water level in the river. The City has not yet used any WID water and has negotiated with WID to extend the banking period for unused water. The diversion of WID water from the Mokelumne River is permitted from March 1 through October 15. The City is currently negotiating with EBMUD to allow operation of the SWTF year-round with 1,000 AFY available from October 16 through the end of February. WID has indicated they will be able to leave the inflatable dam in place year round to allow water supply to the City through the recently completed fish screen and canal intake structure. The intake structure is fitted with a 48-inch outfall pipe to supply water to the City.

The City also investigated the possibility of using the purchased water to recharge the aquifer with spreading basins. However, the costs of this option and the lack of control of the fate of the water once it enters the aquifer has led the City to pursue utilizing the water by treating and pumping the water into the existing water distribution system.

Project Objectives

This report summarizes the conceptual design and feasibility evaluation of alternatives for a surface water treatment facility, storage facilities, and distribution system improvements capable of utilizing the full 6,000 AFY of purchased WID water. Objectives of the feasibility evaluation include:

- Selecting a site for the water treatment plant and ensuring there are no known environmental constraints or technical/engineering problems with the site that would be fatal flaws to implementing the project.
- Evaluating conventional and membrane treatment processes and selecting the best treatment technology based on an evaluation of Mokelumne River water quality and regulations. Based on the preferred treatment process, develop a conceptual design for the SWTF.
- Performing modeling of the water distribution system to evaluate transmission main options to convey treated water from the new SWTF to the City's existing water system also considering supplying water to future development on the west side of the City.
- Performing field investigation of the existing well sites and identifying required improvements to provide chlorination capability.
- Evaluating upgrades to the existing City SCADA system
- Evaluating blending of surface water and groundwater including an evaluation of the existing distribution system piping corrosion layers. Develop recommendations for treatment or other needed measures to prevent customer taste and odor complaints.
- Evaluation of options for upgrading the City's SCADA system and operations and maintenance activities to accommodate the new SWTF and well improvements.
- Determining all permits required for the Project and establishing an approach for environmental CEQA compliance.
- Estimating the total capital and operating cost for the Project and developing a financing plan for the project.
- Laying out a plan for the next steps to implement the project and developing a project schedule.

Report Format and Content

The Surface Water Treatment Facility Conceptual Design and Feasibility Evaluation Report consists of this Summary Report and a Technical Appendix with the individual subject technical memorandums (TMs) as follows:

1. Summary Report

Technical Appendices:

2. Alternative Site Selection

3. Preliminary Watershed Assessment
4. Regulatory Review
5. Treatment Process Design Development
6. Compatibility of Groundwater and Surface Water Supplies
7. Modifications to Existing Delivery System

8a. O&M Facilities

8b. SCADA Facilities

9. Environmental Considerations
10. Capital and Operating Costs
11. Financing Options
12. Feasibility Evaluation
13. Geotechnical Considerations
14. Raw Water Pump Station

Recommended Action Items and Timeframe

The recommended next steps towards implementation of the SWTF project include:

Conduct Source Water Sampling – Sampling of the Mokelumne River for Cryptosporidium should be started in accordance with Source Water Monitoring Guidance Manual for Public Water Systems under the Long Term 2 Enhanced Surface Water Treatment Rule (LT2). The proposed sampling location should be at the recently constructed WID canal intake/fish screen. At least 3 months prior to sampling, the City must submit the proposed sampling plan to CDPH for approval. LT2 requires at least monthly sampling for 24 months for the following: Cryptosporidium, E. Coli, and turbidity. Additional parameters that should be measured include: pH, alkalinity, conductivity, hardness, iron, manganese, total organic carbon, dissolved organic carbon, total and fecal coliform, and temperature.

Prepare Watershed Sanitary Survey – A watershed sanitary survey (WSS) that conforms to the CDPH Surface Water Treatment Rule requirements should be completed. The WSS will allow for determination of the treatment requirements for Cryptosporidium that will need to be incorporated into the SWTF design.

Prepare Preliminary Design Report – The preliminary design report will include confirmation of the SWTF design capacity, update of the site layout and building floor plans, alternative analyses and final selection of treatment processes, updated process flow schematics, and update of transmission main and well improvements plans. The report will serve as the basis of design for the final design and will provide detailed information that will be used for environmental documentation and an updated cost estimate. Other activities that may take place during the preliminary design phase include further geotechnical investigation and bench scale testing and/or pilot testing to confirm membrane design parameters.

Financing Plan – Once project costs are better defined during the preliminary design and potential funding sources are identified, a financing plan should be developed that looks at funding sources, finance options and rate impacts.

CEQA Documentation – Preparation of an initial study is recommended to establish the need for either a mitigated negative declaration of full EIR for the project. As part of the CEQA process public meetings can be held to provide education about the project. Needed permits will be determined as part of the CEQA documentation process.

Detailed Design – The detailed design will include preparation of detailed plans and specifications for the SWTF, pipelines and well improvements. Necessary building permits will be obtained. A final construction estimate based on the completed design will be prepared.

Bidding and Contractor Selection – Bid documents will be prepared and advertised for bid by qualified contractors. Bid results will be reviewed and if acceptable a notice of award will be made to the lowest responsible, responsive bidder.

Construction and Start-up – Construction of the first phase project is anticipated to take approximately 15 months. Towards the end of construction, an operations and maintenance manual will be prepared and used to train operators for the new SWTF. Newly trained operators would then be involved with the start-up and testing of the new SWTF.

A proposed project implementation schedule is presented in Table 1.

Table 1: Proposed Schedule

Project Activity	2007	2008	2009	2010	2011
Feasibility Evaluation					
Preliminary Design					
CEQA/Public Education					
Permitting					
Final Design					
Bid and Award[1]					
Construction					
Startup					
First Year Operations					

[1] Assumes conventional design/bid/build delivery. Alternative delivery methods include design/build, design/build/commission, or design/build operate.

Authorization

The Agreement for Consulting Services and Notice to Proceed for the Surface Water Treatment Facility Conceptual Design and Feasibility Evaluation was received by HDR on May 11, 2007.

Acknowledgements

The following people are acknowledged as having contributed to the preparation of this report:

City of Lodi: Richard Prima, Wally Sandelin, Charles Swimley, Frank Beeler, Kevin Gaither, Lyman Chang, and Mark Lindseth.

HDR Engineering: Robert Ellis, Richard Stratton, Shugen Pan, Michele Stern, Michael Lambert, and Larry Smithey.

West Yost Associates: Bruce West, Chris Ewers, Richard Hubel, and Gerald Fejarang.

Table of Abbreviations

AFY	Acre-feet per year
AAWARF	American Water Works Association Research Foundation
BMPs	Best Management Practices
CAA	Clean Air Act
Cal EPA	California Environmental Protection Agency
CCIC	Central California Information Center
CCT	Central California Traction Company
CDFG	California Department of Fish and Game
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
CHRIS	California Historical Resources Information System
CIP	Clean-in-Place
City	The City of Lodi
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CWA	Clean Water Act
D/DBP	Disinfectants/Disinfection Byproducts
DAF	Dissolved air floatation
DBPs	Disinfection byproducts
DE	Diatomaceous Earth
DOC	dissolved organic carbon
DTSC	Department of Toxic Substances Control
EBMUD	East Bay Municipal Utility District
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
fps	Feet per second
FRP	Fiber-reinforced plastic
GAC	Granular activated carbon
gfd	Gallons/ft^2/day
gpm	Gallons per minute
GWR	Ground Water Rule
HAAs	Haloacetic acids
HOCl	Hypochlorous acid
HPC	Heterotrophic plate count
IDSE	Initial distribution system evaluation
IESWTR	Interim Enhanced Surface Water Treatment Rule
LCP	Local control panel
LCR	Lead and Copper Rule
LMRWSPC	The Lower Mokelumne River Watershed Planning Committee
LT1ESWTR	Long Term 1 Enhanced Surface Water Treatment Rule
LT2ESWTR	Long Term 2 Enhanced Surface Water Treatment Rule
MCC	Motor control center
MCL	Maximum contaminant level

MDS	Microwave Data Systems
MF	Microfiltration
mg/L	Micrograms per liter
mg/L	Milligrams per liter
Mgal	Million gallon
mgd	Million gallons per day
MIB	Methylisoborneol
mL	Milliliter
MRDLs	Maximum residual disinfectant levels
MRDLs	maximum residual disinfectant levels
NAHC	Native American Heritage Commission
NF	Nanofiltration
NF/RO	Nanofiltration or reverse osmosis
NMFS	National Marine Fisheries Service
NOM	Naturally-occurring organic matter
NPDES	National Pollutant Discharge Elimination System
NPSMP	Non-Point Source Management Plan
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTU	Nephelometric turbidity units
OES	Office of Emergency Services
PAC	Powered activated carbon
PL 92-500	Federal Water Pollution Control Act
PLC	Programmable logic controller
PRVs	Pressure-reducing valves
psi	Pounds per square inch
RCRA	Resources Conservation and Recovery Act
RMC	RMC Water, Inc.
RO	Reverse Osmosis
ROW	Right-of-ways
RTUs	Remote Telemetry Units
RWPS	Raw water pump station
RWQCBs	Regional Water Quality Control Boards
SCADA	Supervisory control and data acquisition
SDWA	Safe Drinking Water Act
SJCRCD	San Joaquin County Resource Conservation District &
SOCs	Synthetic organic chemicals
SWRCB	State Water Resources Control Board
SWTF	Surface Water Treatment Facility
SWTR	Surface Water Treatment Rule
TAC	Technical Advisory Committee
TCR	Total Coliform Rule
TDS	Total dissolved solids
THMs	Trihalomethanes
TMs	Technical memorandums
TOC	Total organic carbon

TSCA	Toxic Substances Control Act
TT	Treatment techniques
TTHMs	Total trihalomethanes
TTHMs	Trihalomethanes
UC	University of California
UF	Ultrafiltration
UPRR	Union Pacific Rail Road
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S Fish and Wildlife Service
USGS	U.S. Geological Survey
UV	Ultraviolet
UWMP	Urban Water Management Plan
VFD	Variable frequency drive
VOCs	Volatile organic chemicals
WDRs	Waste Discharge Requirements
WTP	Water Treatment Plant

Summary of Technical Memorandums

A brief summary of each of the individual technical memorandums (TMs) is presented here. These TMs include the technical evaluations, alternative present worth analyses, other pertinent evaluations, and conclusions/recommendations.

TM 2 Alternative Site Selection

Five alternative treatment plant sites were evaluated to assess their feasibility for constructing a SWTF. The locations of the treatment plant sites and the needed raw water and treated water distribution pipelines alternative alignments are shown in Figure 2. The feasibility evaluation was based on the criteria listed below.

- Sufficient size of site (at least 5 acres needed).
- Environmental issues and the ability to avoid significant environmental impacts.
- Estimated costs including transmission pipeline costs and site improvement costs.
- Other benefits such as aesthetic compatibility and use of facilities by public for educational purposes.

A site was eliminated if a significant impact to the environment was identified or the site was not of sufficient size. Alternatives were ranked based on the estimated costs of the project components that are site dependent, with the lowest cost project ranked first. The selected site, (Lodi Lake Site) is of sufficient size, does not have any significant environmental impacts, is the lowest overall cost site, and also provides the opportunity for public education relating to the river and water supply.

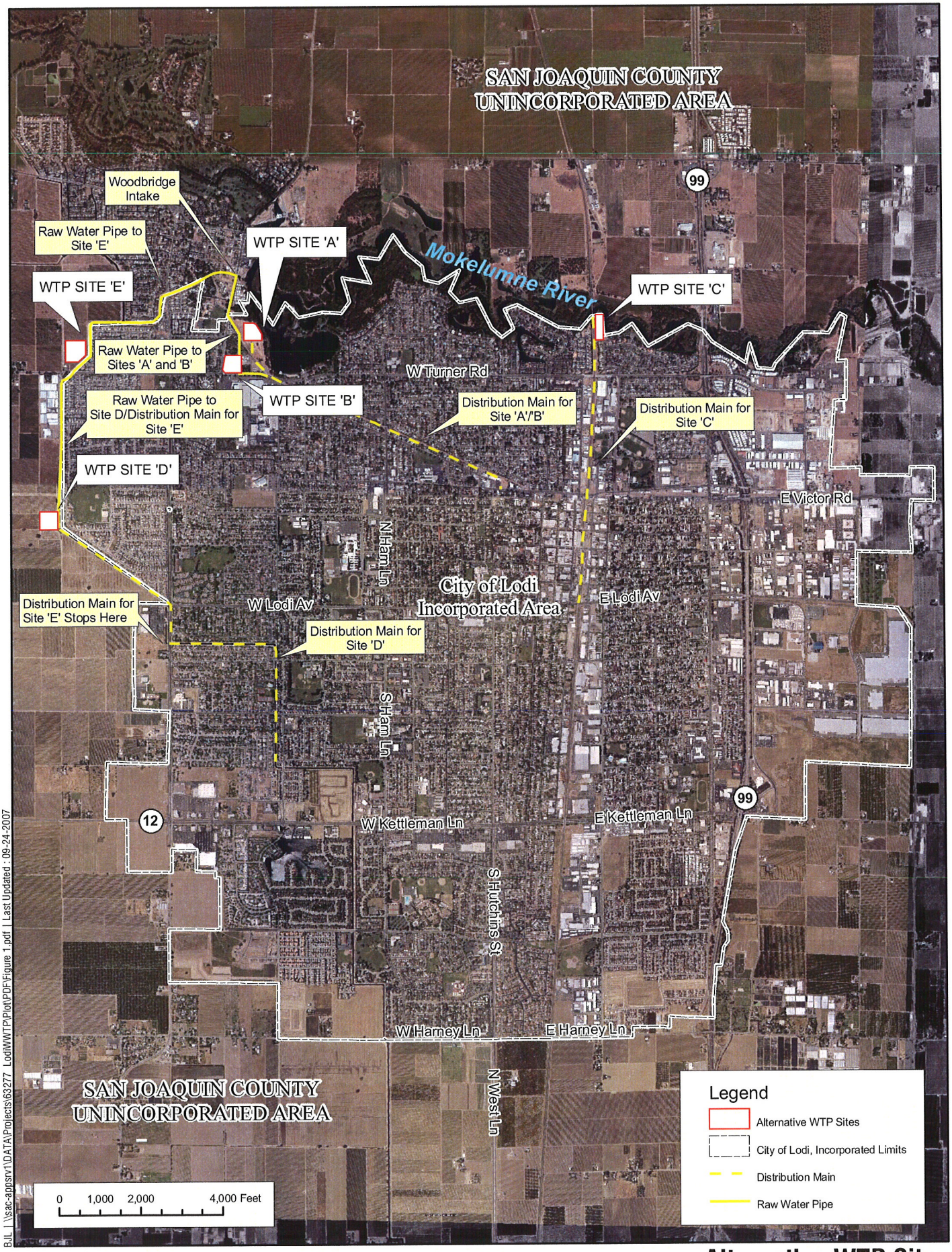
Conclusions and Recommendations

The site selection process was performed early in the process and even preceded many of the other TMs. After completion of the TMs the results presented in the Summary Report still confirm the decision to select the Lodi Lake Site to be correct.

TM 3 Preliminary Watershed Assessment

The objectives of this TM are: (1) to review existing watershed reports/data and summarize water quality data; (2) to identify human and natural activities that may affect water quality; and (3) to determine the level of treatment required based on identified microbiological and other contaminant sources.

This TM provides an overview of the Lower Mokelumne River watershed between Camanche Dam and the Woodbridge Irrigation District (WID) Canal intake and will serve in the future as a basis for the watershed sanitary survey for the SWTF. The Upper Mokelumne River watershed consists primarily of forests and lightly populated open land.



BJL | \\sac-appsrv1\DATA\Projects\63277 Lodi\WTP\Plot\PDF\Figure 1.pdf | Last Updated : 09-24-2007

Alternative WTP Sites

FIGURE 2

Additionally, Pardee and Camanche Reservoirs separate the Upper and Lower Mokelumne River watersheds. For this reason this TM focuses on the Lower Mokelumne River watershed.

The drainage area below Camanche Dam encompasses 80 square miles and is mostly agricultural with some urbanized land. The City of Lodi is the only incorporated city in the watershed. Other communities include Acampo, Lockeford, Clements, Victor, and Woodbridge. Outside the urban areas, agricultural use predominates in the watershed from Camanche Reservoir to Lodi. Estimated agricultural use trends are 51 percent vineyard, 31 percent dairy/grazing, 9 percent orchard, 8 percent annual cropland, and 1 percent idle.

The potential contaminant sources in the watershed are low to moderate and include: Urban, and industrial runoff; Agricultural runoff from: grazing animals, concentrated animal facilities, pesticide/herbicide use; Wild animals; Mine runoff; Solid and hazardous waste disposal facilities; Recreational use; Unauthorized activity; Transportation corridors and bridges; Geologic/seismic hazards; and Fires.

The City of Lodi Public Works Department collected water quality data at four sampling sites from May 2006 through July 2007. Water quality at Site 1 (Mokelumne River), which is not affected by the operation of Woodbridge Dam, was sampled throughout the year. Water quality at Sites 2 and 3 (WID Canal) was sampled only from April through October when water was present in the WID Canal. Water quality at Site 4 (Woodbridge Dam) was sampled only from November through March. It should be noted that data represent the general quality of the water at the sampling sites. Additional sampling has been performed by City Storm Water trackers during the winter season. This data has shown that the raw water turbidity could be greater than 50 NTU during a storm event.

Conclusions and Recommendations

Overall, the Mokelumne River is an excellent water source that has low total dissolved solids (TDS) and total organic carbon (TOC) concentrations. No "fatal flaws" in water quality or contamination threats were discovered. The levels of total coliform and *Giardia* Cysts are slightly elevated. A surface water treatment plant utilizing either membranes or the combination of conventional filtration followed by ultraviolet disinfection is recommended.

A watershed sanitary survey (WSS) that conforms to the CDPH Surface Water Treatment Rule requirements should be completed. The WSS will allow for determination of the treatment requirements for Cryptosporidium that will need to be incorporated into the SWTF design.

TM 4 Regulatory Review

The delivery of a treated surface water supply into the City water system will require additional water quality monitoring and data reporting and compliance with additional drinking water regulations. Many of the drinking water regulations are applicable to both the existing groundwater supplies and the proposed surface water supply, but several regulations that will

apply to the surface water supply are of minimal relevance to the existing groundwater supplies.

Drinking water regulations of particular importance to the surface water supply project include:

- National Primary Drinking Water Regulations (1975)
- Secondary Drinking Water Regulations (1979, 1991)
- Phases I, II and V Regulations (1987, 1991 and 1992, respectively)
- Surface Water Treatment Rule (1989)
- Total Coliform Rule (1989)
- Lead and Copper Rule (1991)
- Consumer Confidence Reports Rule (1998)
- Stage 1 Disinfectants and Disinfection Byproducts Rule (1998) that superseded Total Trihalomethane Rule (1979)
- Interim Enhanced Surface Water Treatment Rule (1999)
- Unregulated Contaminants Monitoring Rule – First Cycle (1999)
- Groundwater Rule (2006)
- Filter Backwash Recycling Rule (2001)
- Long-Term 2 Enhanced Surface Water Treatment Rule (2006)
- Stage 2 Disinfectants and Disinfection Byproducts Rule (2006)
- Unregulated Contaminants Monitoring Rule – Second Cycle (2006)

The California Department of Public Health (CDPH) is a primacy agency with responsibility for enforcement of the federal and state Safe Drinking Water Acts. In some cases, the CDPH has yet to establish a state regulation as a companion to a federal regulation, but is responsible for enforcement of the federal regulation (e.g. Groundwater Rule). On the other hand, the CDPH has established several maximum contaminant levels (MCLs) that are more stringent than the corresponding federal MCLs and additional MCLs for several federally unregulated contaminants. The more stringent of the CDPH and federal regulations and MCLs will apply to the SWTF project.

The SWTF design is anticipated to provide the City with the necessary tools to achieve and maintain compliance with the current drinking water regulations. However, the CDPH may promulgate additional regulations affecting the SWTF design in the future. The initial design can address any additional regulatory requirements that take effect prior to SWTF construction. Future regulatory requirements are best accommodated by designing the SWTF for adaptability and including space allowances for future plant additions.

Conclusions and Recommendations

The City is advised to conduct a comprehensive water quality monitoring and testing program to better characterize the surface water supply, and address the findings of this program in the SWTF design. In future preparation for SWTF startup, the City will need to expand its water quality monitoring program for the distribution system in consultation with the CDPH to ensure compliance with the regulatory requirements.

Sampling of the Mokelumne River for Cryptosporidium should be started in accordance with Source Water Monitoring Guidance Manual for Public Water Systems under the Long Term 2 Enhanced Surface Water Treatment Rule (LT2). The proposed sampling location should be at the recently constructed WID canal intake/fish screen. At least 3 months prior to sampling, the City must submit the proposed sampling plan to CDPH for approval. LT2 requires at least monthly sampling for 24 months for the following: Cryptosporidium, E. Coli, and turbidity. Additional parameters that should be measured include: pH, alkalinity, conductivity, hardness, iron, manganese, total organic carbon, dissolved organic carbon, total and fecal coliform, and temperature.

Various other regulations and permitting requirements will affect the SWTF design, construction and operation. Therefore, the City is advised to meet and consult with CDPH on a regular basis over the course of project development and to include a permitting action plan in the scope of services for the SWTF design phase to avoid significant delays in obtaining the necessary construction and operation permits.

TM 5 Treatment Process Design Development

The design capacity of the SWTF should be sufficient to treat the contracted surface water and future surface water supplies. The design capacity should allow for treating the available surface water per the WID agreement and allow the wells to be exercised throughout the year.

For the purposes of this analysis, it is assumed that the first phase of the SWTF will be required to fully utilize the 6,000 AFY contracted surface water. The SWTF will treat 5,000 AF from March 1 to October 15 and 1,000 AF from October 16 to end of February, assuming that EBMUD allows the City to use 1,000 AFY during winter. The required design capacity of the first phase SWTF is 8 mgd. The final phase of the SWTF could potentially be sized to fully utilize the maximum 13,000 AFY of potential future contracted water. The SWTF will treat 11,000 AF from March 1 to October 15, and 2,000 AF from October 16 to end of February, assuming a 2,000 AF winter diversion is allowed by EBMUD. The estimated design capacity of the final phase SWTF is 20 mgd.

Treatment technologies available for the SWTF include either a conventional process consisting of coagulation, flocculation, sedimentation, dual media (anthracite/sand) filtration; or a membrane treatment process utilizing microfiltration or ultrafiltration membranes. Design criteria for each alternative treatment process are developed considering raw water quality, treated water quality goals. The alternatives were compared based on capital cost, operation and maintenance cost, and other factors.

Conclusions and Recommendations

Both conventional treatment and membrane treatment were evaluated for the SWTF ands both technologies could treat the water to meet current regulations. Membrane filtration is recommended based on its ability to provide a positive barrier against pathogens, smaller foot print, less chemical usage, lower sludge production, ease of expansion, and lower total present worth cost.

Based on the initial and final phase surface water demands, it is recommended that the City construct an 8 MGD SWTF for the first phase. This size of plant will allow utilization of the current 6,000 ac-ft per year contracted water. Any banked water over and above this amount will be available for sale or other non-potable uses within the City. Space should be reserved for a future planned expansion to 20 mgd.

Picture of two Memcor submerged membrane systems (Yuba City, CA- upper left, and Bendigo, Australia- lower left), a Zenon 1000 membrane cassette module (South San Joaquin Irrigation District-upper right), and a Pall pressure membrane system (Yucaipa Valley Water District- lower right)

Disinfection usually is the last step of a treatment process and provides the final barrier against pathogens prior to pumping to the distribution system. Types of disinfection systems

considered include ultraviolet (UV) light, chlorine, chloramines, and ozone. To meet EPA and California Department of Public Health regulations log removal/disinfection of pathogens and to maintain a residual in the distribution system, chlorine is recommended. To minimize risks to the public sodium hypochlorite solution is the recommended form of chlorine to be added.

Two buildings are proposed for the SWTF – one to house the membrane filtration equipment, offices, laboratory, control room, and public education element and a second building for chemical storage, residuals handling, workshop and high service pumping. The building architecture will be selected to enhance and compliment the surrounding area.

TM 6 Surface Water and Groundwater Blending

The treated surface water supply will account for about one-third of the total delivery into the water distribution system, on average, but potentially ranging from zero to nearly 100 percent of the total delivery depending on day-to-day and month of the year water supply operations. Some customers are likely to receive one source of supply almost exclusively. Other customers may experience frequent changes depending on their geographic locations with respect to the existing groundwater supplies and the proposed surface water supply. Due to the anticipated changes and variations in distributed water quality, groundwater and surface water supply compatibility is an important consideration for corrosion control, regulatory compliance, and customer satisfaction.

Maintenance of a detectable chlorine residual throughout a surface water distribution system is required by the Surface Water Treatment Rule, and continuous disinfection of most groundwater supplies is required by the recently promulgated Groundwater Rule. Therefore, the City will need to retrofit chlorination equipment and continuously chlorinate the groundwater supplies when required by the Groundwater Rule or concurrently with SWTF startup, whichever comes first.

The existing distribution system contains pipelines, fittings and valves constructed of various metallic and non-metallic materials. The City's piping has experienced below average rates of pipeline corrosion with the existing groundwater supplies. However, the Mokelumne River water is relatively soft, has a tendency to dissolve calcium carbonate, and without treatment, could increase the rates of corrosion of unlined iron and steel pipelines and the erosion of asbestos-cement pipelines. Proposed chemical additions at the SWTF will reduce the corrosion potential and the related effects on distributed water quality, but cannot achieve complete compatibility of the groundwater and surface water supplies. Older galvanized steel service connections and plumbing materials are particularly susceptible to increased rates of corrosion particularly after initial introduction of surface water before equilibrium is achieved.

Conclusions and Recommendations

Given the low levels of corrosion scales observed in the existing distribution system, blending of surface water with the existing groundwater system will be feasible with adjustment of pH and addition of corrosion inhibitor to the surface water entering the distribution system.

The City should initiate continuous chlorination of the groundwater supplies at least several months prior to SWTF startup, and gradually increase the chlorine dosages, to acclimatize the customers and pipelines to the presence of chlorine residuals.

The City should initiate a public education program in advance of groundwater chlorination and SWTF startup to prepare the City water customers for the anticipated changes in water quality.

TM 7 Modifications to Existing Delivery System

With the introduction of a new surface water supply, distribution system modifications will be required to distribute surface water efficiently to the existing distribution system and to modify existing groundwater wells to accommodate water quality monitoring and disinfection regulations.

The City's hydraulic model was used to determine which modifications will be most effective at integrating the Phase 1 flows from the SWTF. The hydraulic model was operated by City staff. When an analysis was needed for this project, the project team submitted modeling requests to the City, and the City returned results in the form of mapping and pumping rate tables.

The Phase 1 SWTF production facility is sized to deliver 8.0 million gallons per day (MGD), or approximately 5,600 gallons per minute (gpm). The SWTF will operate year-round to provide the 6,000 acre-feet per year available from the Woodbridge Irrigation District. The SWTF will store as much as 3.0 million gallons in its clearwell, allowing the SWTF to provide as much as 10 MGD, or approximately 7,000 gpm, to the distribution system during peak demands. The modeling was performed based on maintaining a wellhead pressure of 60 psi and meeting the City's pressure criteria for fire flow and peak hour demands.

Two transmission main alignments were evaluated by the model: 1) Holly Drive – 6,000 feet of 24-inch diameter pipeline and 2) Mills Avenue 2,450 feet of 36-inch diameter pipeline. Based on this evaluation, it is recommended that the City construct a 36-inch-diameter transmission pipeline beginning at the existing 10-, 12-, and 14-inch-diameter pipes at the intersection of North Mills Avenue and West Turner Road, then south along North Mills Avenue to the intersection with West Lockeford Road, connecting to existing pipelines six inches in diameter and larger with PRVs to allow maintain existing pressures in the distribution system to allow for exercising existing wells.

The hydraulic modeling also indicates that the City will not need to replace any of the well pumps with higher-head pumps due to the surface water supply, but this assessment must be validated by calibrating the model.

Conclusions and Recommendations

Only one of the existing groundwater supply facilities already has permanent chlorination equipment. With the introduction of surface water, it is recommended that all of the other groundwater supply facilities be updated to a common sodium hypochlorite continuous

chlorination configuration to meet EPA and State regulations for maintaining chlorine residual in distribution systems.

The following modifications to the existing well installations and distribution system are recommended:

- Chlorination of each groundwater supply to provide a minimum of 0.5 mg/L of residual chlorine at the entry point into the distribution system.
- Continuous monitoring of the chlorine residual at each distribution system entry point.
- A supervisory control and data acquisition (SCADA) system should monitor the chlorine residual measurements, well pump on/off status, and the chemical feed pump on/off status, and alert the on-call operator of any anomalies or failures of the chlorination system operation.
- Construction a 36-inch-diameter transmission pipeline beginning at the intersection of North Mills Avenue and West Turner Road, then south along North Mills Avenue to the intersection with West Lockeford Road, connecting to existing pipelines six inches in diameter and larger with PRVs to allow maintain existing pressures in the distribution system to allow for exercising existing wells.

TM 8A Operations and Maintenance Facilities

Conclusions and Recommendations

Based on discussions with City operations and engineering staff, it was agreed that the functions at the site should be separated into two buildings based on whether they are "clean" or "dirty" tasks. The proposed operations building ("clean" building) will contain laboratory, and administration facilities that will showcase the advanced membrane treatment technology and SCADA system with public exhibits in the Operations building. Only the Operations building will be designed to meet the requirements of the American with Disabilities Act (ADA). Of the proposed two stories in the Operations building, the first floor will include an electrical maintenance shop, lobby, locker rooms administration, laboratory, offices, process control center, and filtration room. The second floor will include the meeting rooms, exhibit space, and public restrooms.

The facilities associated with dirtier activities are proposed for the Accessory Building. This building will include chemical handling facilities, solids dewatering, high service pumps, workshops for technical staff, spare parts warehouse, mud room, and a unisex lavatory. A maintenance shop and storage area will be provided in the chemical building.

TM 8B SCADA Facilities

The existing utilities Supervisory Control, Alarm, and Data Acquisition (SCADA) system consists of Remote Telemetry Units (RTUs) located at the well sites, lift stations, and pump stations. The existing RTUs are Landis & Gear units that are in the process of being replaced with PLC based RTUs. The current system network utilizes a leased telephone line and

communicates over the telephone lines to the RTUs. The new RTUs are expected to communicate in a similar fashion. The existing central station is located at the City's corporation yard and the operator monitors the water system, storm water system, wastewater system and the power system at the same location. In addition to the telephone line communication, there is an existing fiber optic cable network installed on the City's power distribution poles. The fiber optic cable network is connected to the central station, City Hall, Police Department and provides connections to various electrical substations for monitoring and communication.

Recommendations

Utilizing the existing fiber optic network to the extent possible is recommended. The existing fiber optic cable network could be easily extended to the surface water treatment facility (SWTF) site. There is a fiber optic node at the Maclane substation which is adjacent to the proposed site of the SWTF. The reliability and speed of communicating over fiber optic cable is much better than operating over a radio link or telephone. At each remote site, (well, lift station, and pump station) the cost of connecting to the fiber optic cable should be evaluated.

The recommended PLCs for the SWTF are Allen Bradley and the recommenced SCADA program is RSView. This matches the PLCs and SCADA program used at the White Slough WWTP. Plant operators and technicians are already familiar with these systems, which will allow for more efficient overall operation for the City.

TM 9 Environmental Considerations

The City of Lodi Public Works Department identified four potential SWTF sites and gave HDR the option of identifying one or more additional sites to be included in the screening process. Sites A through D were identified by the City as potential SWTF sites (Figure 2). Site E was identified by HDR as an additional potential site based on its location along the Woodbridge Canal and near the west side of the City's water distribution system (Figure 2).

Reconnaissance-level field surveys were conducted for each of the five selected sites and their general pipeline routes. In addition, aerial photographs, U.S. Geological Survey (USGS) quadrangle maps, and other readily available information about each alternative site were reviewed. The environmental constraints associated with the five potential SWTF sites and the general routes of their respective raw and treated water pipeline were evaluated. Constraints for evaluation include land use, biological resources, and cultural resources. The purpose of this study is to identify any "fatal flaws" stemming from environmental issues at each alternative SWTF site. This assessment is qualitative in nature, rather than quantitative. A qualitative assessment is suited to fatal-flaws analysis because environmentally-related fatal flaws are readily identifiable with coarse-level detail.

The Lodi Lake Site possesses the least constraints for development based on land use and biological resources. The General Mills site possesses the fewest constraints based on biological and cultural resources. Because of land use constraints, and biological and cultural

resources; the old landfill site along the railroad right-of-way is unacceptable as a potential site. The sites along the WID canal would convert agricultural land to industrial uses.

Recommendations

Considering all environmental constraints, the Lodi Lake site would be the most acceptable site for the Surface Water Treatment Facility (SWTF).

No environmental fatal flaws were discovered for the Lodi Lake site.

TM 10 - Capital and Operating Costs

Implementation of the surface water supply project will require a major capital investment by the City of Lodi (City) and will increase the operations and maintenance (O&M) costs for the City water system. Therefore, preliminary capital and O&M cost estimates were prepared to assist the City in budgeting for project implementation. The scope of this analysis is confined to the Phase 1 flows for the project, the facilities necessary to deliver the water under the City's existing contract with Woodbridge Irrigation District for 6,000 acre-feet per year of raw water.

The capital cost components include a raw water pipeline and pump station, surface water treatment facility (SWTF), finished water storage facility and pump station, a transmission main, existing groundwater supply facility improvements, and associated engineering and other project delivery costs.

Raw Water Pipeline and Pump Station

Approximately 240 lineal feet of 48-inch diameter pipeline are needed to connect the Mokelumne River diversion facility to a raw water pump station, approximately 2,200 lineal feet of 30-inch diameter pipeline, and 340 feet of 30-inch-diameter bore-and-jack crossing are needed to connect the raw water pump station to the SWTF. The construction cost estimate is $2.9 million, excluding contingencies.

Surface Water Treatment Facility

The primary assumptions for the SWTF construction cost estimate are a nominal capacity of 8.0 million gallons per day (mgd) to accommodate Phase 1 flows and the use of positive pressure driven membrane filtration as described in Technical Memorandum No. 5 (TM 5). A preliminary estimate of the construction cost itemized in Table 13 of TM 5 totals $21.7 million (without considering the raw water pumping station), and excluding contingencies.

Transmission Pipeline

To accommodate the anticipated Phase 1 flow rates, the surface water supply project will include approximately 2,450 lineal feet of 36-inch diameter transmission pipeline and several pressure reducing stations from the SWTF to the existing water distribution system. (See TM 7 and Table 3 for details.) The transmission pipeline cost estimate of $1,852,000. The estimated construction costs are calculated with 2008 values and escalated to the anticipated years of

construction. These projected values take into account the projected inflation rate for materials and energy.

Groundwater Supply Facility Improvements

At present, chlorine residuals are not required or maintained in the water distribution system. However, the City will need to implement continuous chlorination of the groundwater supplies in the near future due to regulatory requirements addressed in TM 4. For the current evaluation, it is assumed that the City will retrofit wells with chlorination equipment at wells 3R, 5, 6R, 10C, and 13 through 17. The remaining groundwater wells would not require capital improvements, and the City would not construct additional groundwater supply facilities for the life of the surface water supply project. The individual groundwater supply facility improvement construction cost estimates range from approximately $21,000 to $29,000, depending on well pump capacity. The total construction cost estimate of approximately $232,000 for the nine groundwater supply facilities was escalated to the anticipated years of construction.

The total project capital cost estimate including engineering, financing costs, and contingency is $42.0 million in 2008 dollars.

Operations and Maintenance Cost Estimates

The O&M cost components include chemicals, labor, power, solids disposal, and outsourced services starting in the first year (2011) of SWTF operations. The initial total annual estimated cost including contingency is $2.2 million per year.

Cost Summary

The capital and O&M cost of the recommended projects is summarized in Table 2.

Table 2: Capital and O & M Costs

Capital Cost	$
Feasibility Study/Pre-Design @ 2% of Construction Cost	$ 507,300
Detailed Design @ 8% of Construction Cost	$ 2,110,300
Field Investigations/CEQA/ Permitting @ 3% of Construction Cost	$ 791,400
Construction of Raw Water Pipeline and Pump Station	$ 3,116,000
Construction of Surface Water Treatment Facility	$ 20,798,000
Construction of Transmission Mains	$ 1,852,000
Construction of Grndwtr. Well Station Improvements (w/Disch. Improvements)	$ 613,000
Securing Bonds @ 1.5% of Construction Cost	$ 395,700
Construction Management @ 7% of Construction Cost	$ 1,846,500
Engineering Services during Construction @ 5% of Construction Cost	$ 1,318,900
Subtotal	$ 33,349,100
Combined Cost Contingency @ 30% of Construction Cost	$ 7,913,700
Project Cost	**$ 41,263,000**

O & M Costs	$
Chemicals (Groundwater)	$146,200
Chemicals (Surface water)	$515,600
Labor	$624,300
Net Power (SWTF minus groundwater well power costs)	$91,400
Solids Disposal	$26,000
Outsourced Services	$63,200
Total Annual O & M Cost	**$1,467,000**

TM 11 Preliminary Financing Options

The original concept for financing the design and construction of the facility was based partially on development fees from new construction. Due to the general economic slow down and lack of residential development, both the fees from new construction and demand for service from the water treatment plant have altered how we might pay for this project, and certainly the time line for construction.

Goodwin Consulting Group (GCG) will coordinate with HDR and City staff to (i) compile cost estimates for the water treatment facilities and ongoing O&M costs, (ii) confirm assumptions related to existing and future development within the City, and (iii) identify the benefit units (i.e. gallons per day or other factors) specific to each land use that were used by HDR to estimate the cost of the improvements. GCG will set up a dynamic model that will be used to allocate costs to participating land uses and to test scenarios developed in conjunction with the City relative to the amount of contribution, if any, from existing land uses. GCG will then calculate the one-time burdens that would result if the improvements were funded on a pay-as-you go basis, which will define the "fair share" participation for each residential unit and non-residential acre. If requested, GCG will present a projected revenue stream based on given absorption assumptions to demonstrate how impact fee revenues would compare to facility costs as development in the City progresses. This cash flow analysis is likely to demonstrate that funding gaps will occur, which will mandate equity contributions or the use of public financing mechanisms to generate lump-sum funding to close the gaps. GCG will prepare a land-secured financing analysis to demonstrate annual cash flows assuming the sale of tax exempt, Mello-Roos bonds to fund facilities as needed based on the infrastructure phasing schedule. This analysis will be highly implementation-oriented and will consider all details that could impact formation of a financing district and issuance of bonds.

GCG will also determine the monthly water rates that will be needed to pay the ongoing operations and maintenance costs associated with the water treatment facilities. Once again, GCG will work with HDR and the City to define various scenarios relative to participation by existing rate payers and new development, and the monthly rate for each scenario will be calculated.

TM 12 Feasibility Evaluation

A fatal flaw evaluation for the Lodi Lake site was conducted to ensure that site is suitable for the SWTF. Further investigation of Site A was performed to uncover any potential fatal flaws. A discussion of the potential fatal flaws and findings follows:

Environmental Hazards – A Phase I Environmental Site Assessment of the Lodi Lake site was conducted by Youngdahl Consulting Group. A copy of the report is found in TM 13. The findings indicate that the site was historically used as a vineyard until the 1980s and has been fallow for the last 20 years. The assessment revealed no evidence of recognized environmental conditions.

Geotechnical Issues – A feasibility level geotechnical investigation of the Lodi Lake Site was conducted by Youngdahl Consulting Group (See TM 13). The study concluded that soil conditions are good and that construction of the proposed SWTF at the Lodi Lake site is feasible without the need for unusual or costly construction methods. HDR recommends that the additional soil borings be drilled and the depth to groundwater checked again when Lodi Lake is full to determine the high groundwater level at the site.

Ability to Supply Water to the City – The Lodi Lake site is well situated between the WID fish screen intake point and the distribution system. Construction of a raw water pump station and pipeline is presented in TM 14 and is found to be feasible. Construction of a finished water pipeline along Mills Avenue to feed surface water into the distribution system was shown to be feasible in TM 7.

Blending of Surface Water with Existing Groundwater System – An evaluation of the water chemistry of the surface water and its potential effects on the water distribution was evaluated in TM 6. The evaluation concluded that by raising the pH and adding a polyphosphate corrosion inhibitor, the surface water can successfully be blended with the groundwater with minimal noticeable impacts to users. Addition of chlorination systems to the existing wells that do not already have these facilities will be feasible.

Accessibility of Facilities for O&M activities – A detailed site plan was developed for the site based on input from the City Parks Department. A joint use entrance off of Turner Road that can be shared by both the park and the SWTF has been presented in TM 05.

Access to the SWTF and Park and sharing of the site will not present a fatal flaw.

Recommendations

Based on further analysis of the selected Lodi Lake Site, no fatal flaws were uncovered. Construction and operation of the proposed SWTF at the Lodi Lake site is found to be feasible.

TM 13 Geotechnical Considerations

To further evaluate the feasibility of the recommended site, a geotechnical feasibility study and a Phase I Environmental Site Assessment were conducted on the Lodi Lake site by Youngdahl Consulting Group.

Recommendations

Based on the results of the field explorations and analysis, the feasibility study concluded that construction of the proposed STWF at the Lodi Lake site is feasible from a geotechnical standpoint as long as the recommendations in the report are incorporated into the design plans and implemented during construction. The Phase I ESA found no recognized environmental conditions at the Lodi Lake Site.

TM 14 Raw Water Pump Station

The raw water pump station design is based on supplying raw water to the SWTF. The initial and final phase capacities of the SWTF are 8 million gallons per day (MGD) and 20 MGD, respectively, based on TM 5 - SWTF Treatment Process Design Development. A preliminary RWPS layout and pipeline alignment will be developed. The County is planning to widen and reconstruct Lower Sacramento Road in the near future. Ideally, the pipeline alignment should be determined in sufficient detail to be included in the design of the roadway improvements. The initial phase is expected to be in operation in three years and the final phase will be built much later.

The location of the RWPS is planned to be on property owned by WID to the west of Lower Sacramento Road and south of the WID canal that is close to the fish screen and the 48-inch connection installed with the fish screen project. The pump station will include ultimately 6 vertical turbine pumps inside of a building and a standby generator. The City and WID are negotiating to lease a portion of the WID owned land.

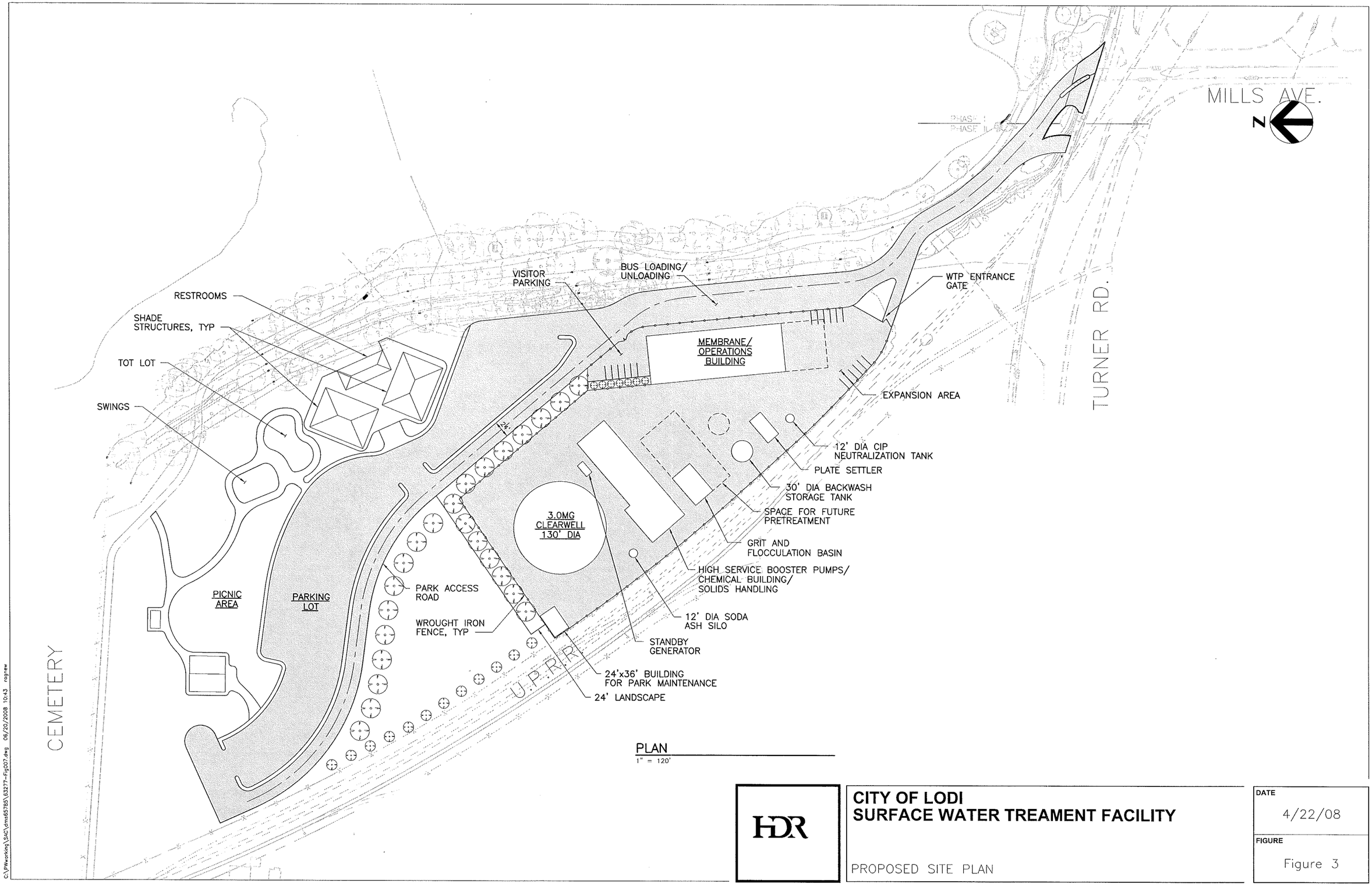
Recommendations

Three alternatives of the pipeline alignments were evaluated. The recommended alignment calls for the 30-inch pressure line to be located along the center of Lower Sacramento Road until it reaches the UPRR tracks. At this point, the pipeline will make a turn before it enters the UPRR right of way and run parallel to the UPRR outside the right of way beneath the cemetery. It is expected that a permit from and/or coordination with the cemetery will be required for this alignment.

Recommended Treatment Plant

Site Layout

A preliminary layout of the recommended SWTF at the Lodi Lake site is presented in Figure 3. The SWTF consists of a membrane operations building and an ancillary building which includes high service pumps, chemical storage and feed systems, and mechanical solids



PLAN
1" = 120'

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HDR

CITY OF LODI
SURFACE WATER TREAMENT FACILITY

PROPOSED SITE PLAN

DATE
4/22/08

FIGURE
Figure 3

dewatering system. Other components of the SWTF include flocculation basin, plate settler for filter backwash water, filter backwash storage tank, and a 3.0 Mgal clearwell.

The preliminary SWTF site layout is based on a first phase capacity of 8 mgd. Space is reserved for potential expansion to an ultimate capacity of 20 mgd and possible addition of process components in the future. The plant will be accessed from Turner Road along the river levy with an access road shared with the park. The SWTF will be integrated with the park development with an educational facility located on the upper floor of the membrane filtration building.

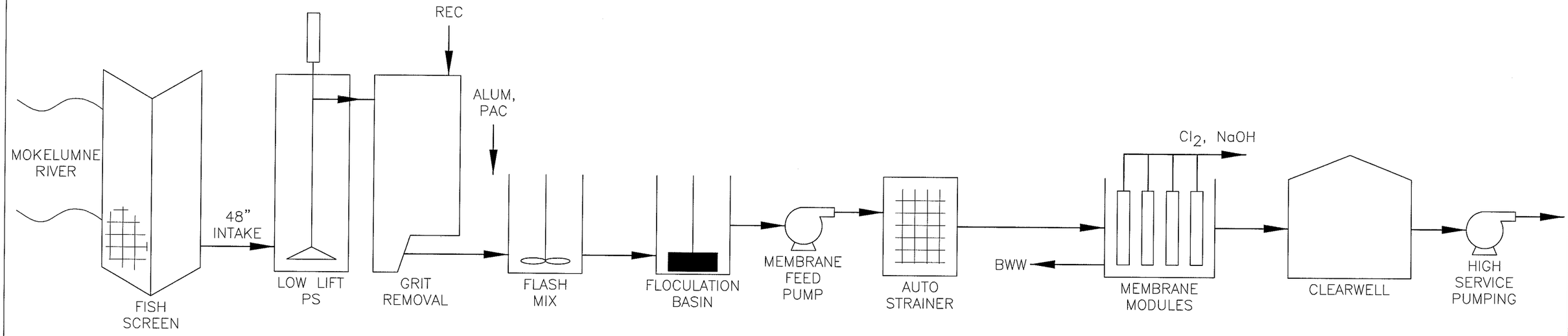
Process Description

The recommended process includes a raw water pump station on WID property near the canal that will pump from the WID fish screen structure to the plant; an onsite flocculation basin (with coagulant and/or powered activated carbon (PAC) addition, if needed); a membrane filtration system including pumps and strainers; sodium hypochlorite (chlorine) disinfection, a 3.0 million gallon (Mgal) clearwell for contact time and storage; and high service pumping. In addition to chlorine, chemicals to be added will include PAC if needed for taste and odor control, alum as a coagulant to remove organics (if needed); soda ash to increase alkalinity and provide a stable pH; and polyphosphate for treated water stabilization to reduce corrosion of distribution systems and prevent red water events. A schematic of the recommended process in presented in Figure 4.

Operations Building

The membrane operation building has two stories. The first floor includes areas for membrane filters and accessories, mechanical room, electrical room, and a workshop. The operations room, laboratory, offices, break room, lobby area, and men and women's locker rooms are also located in the first floor.

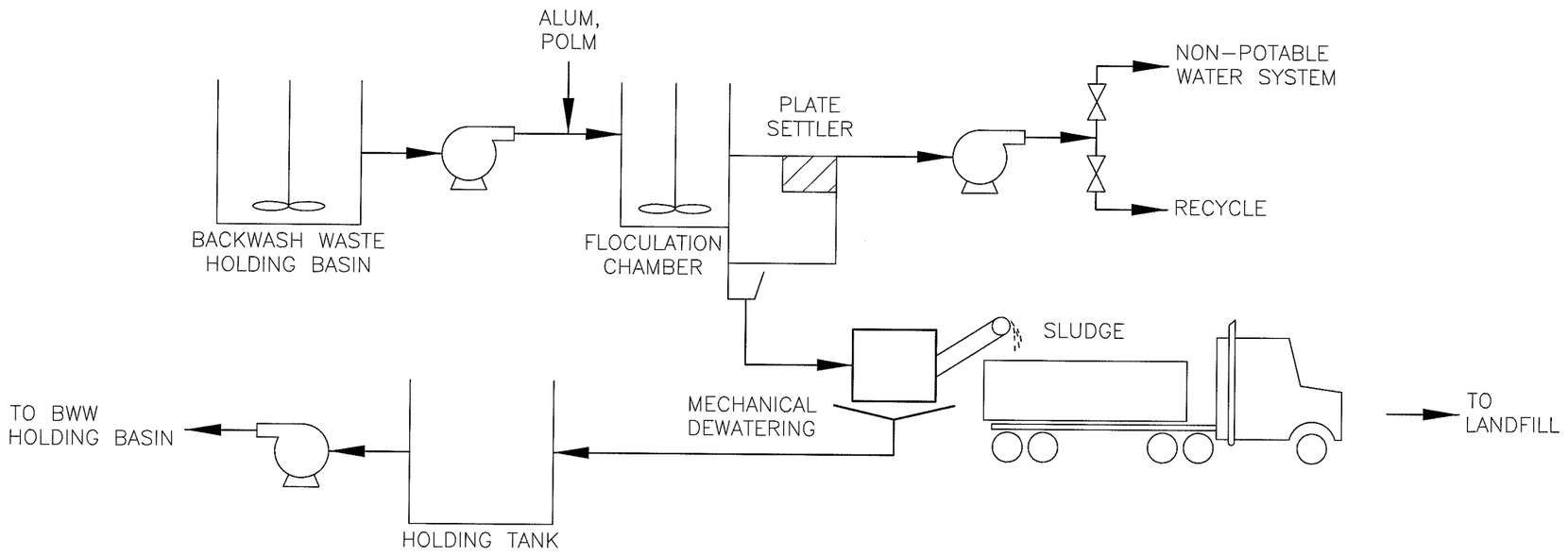
The second floor includes a conference room and several exhibit rooms/gallery from where the public could view the Lodi Lake and Mokelumne River on one side and the membrane water treatment systems on the other side. A balcony and open meeting room along with a small kitchen is also provided to allow for public functions to be held. A preliminary layout of the membrane operations building and an elevation view of the building are presented in Figures 5 and 6, respectively.



MEMBRANE TREATMENT

SCALE: NONE

1



MEMBRANE SOLIDS HANDLING

SCALE: NONE

2

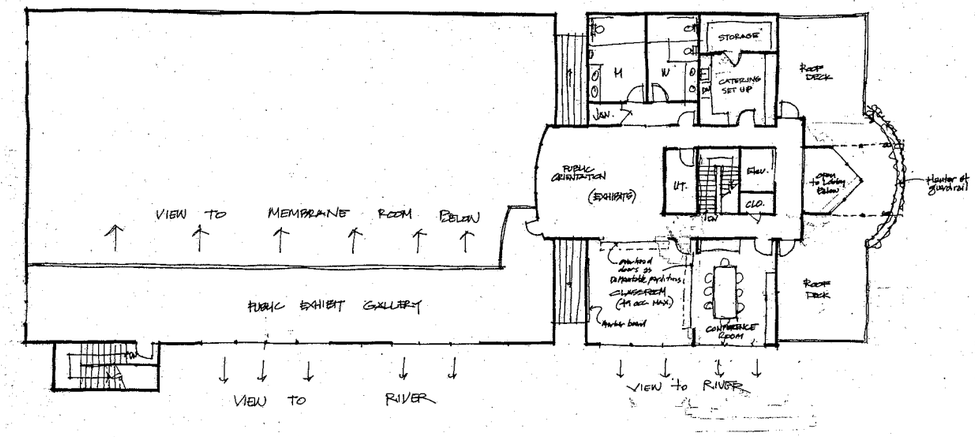
HDR

FLOW SCHEMATIC
MEMBRANE TREATMENT

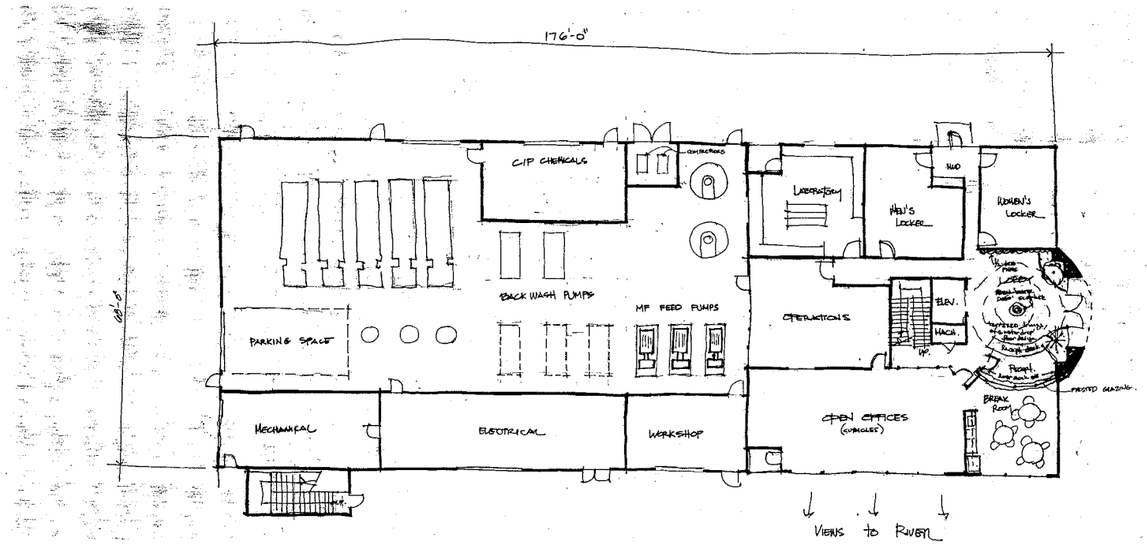
CITY OF LODI – SURFACE WATER TREATMENT FACILITY

DATE
6/19/07

FIGURE
4



SECOND FLOOR PLAN



FIRST FLOOR PLAN

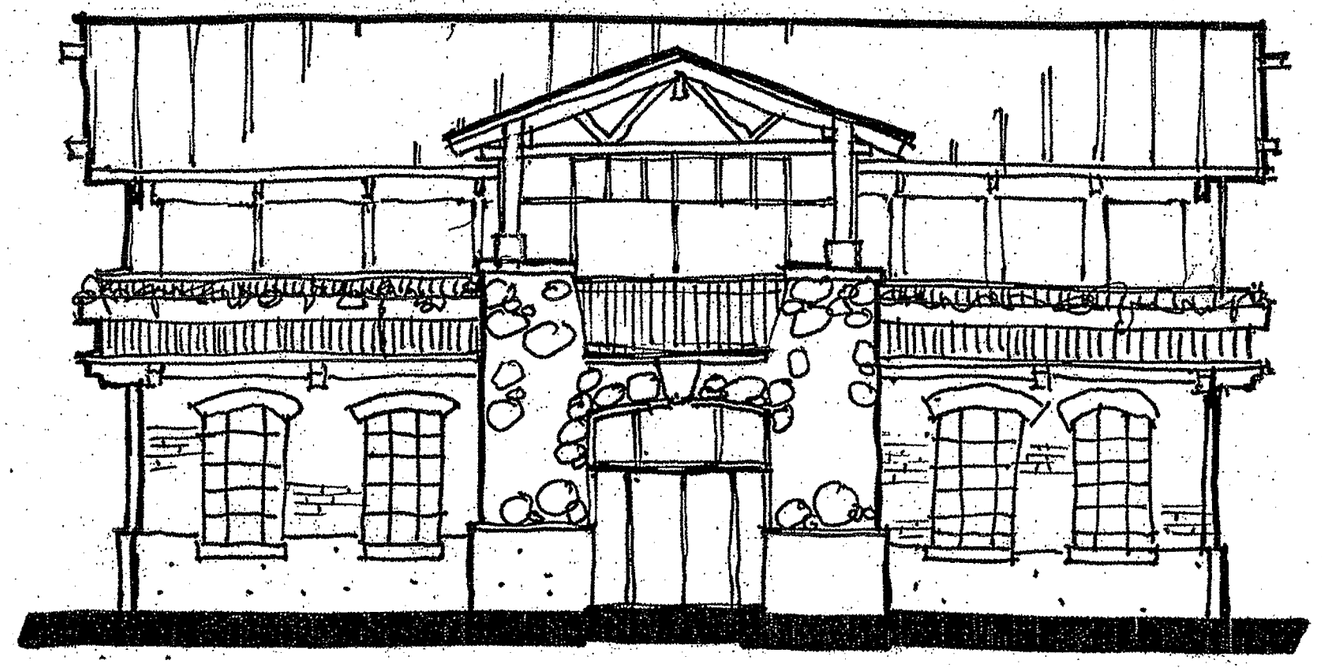
HDR

CITY OF LODI
SURFACE WATER TREAMENT FACILITY

PROPOSED MAIN OPERATIONS BUILDING PLAN

DATE
4-15-08

FIGURE
Figure 5



ELEVATION
NTS

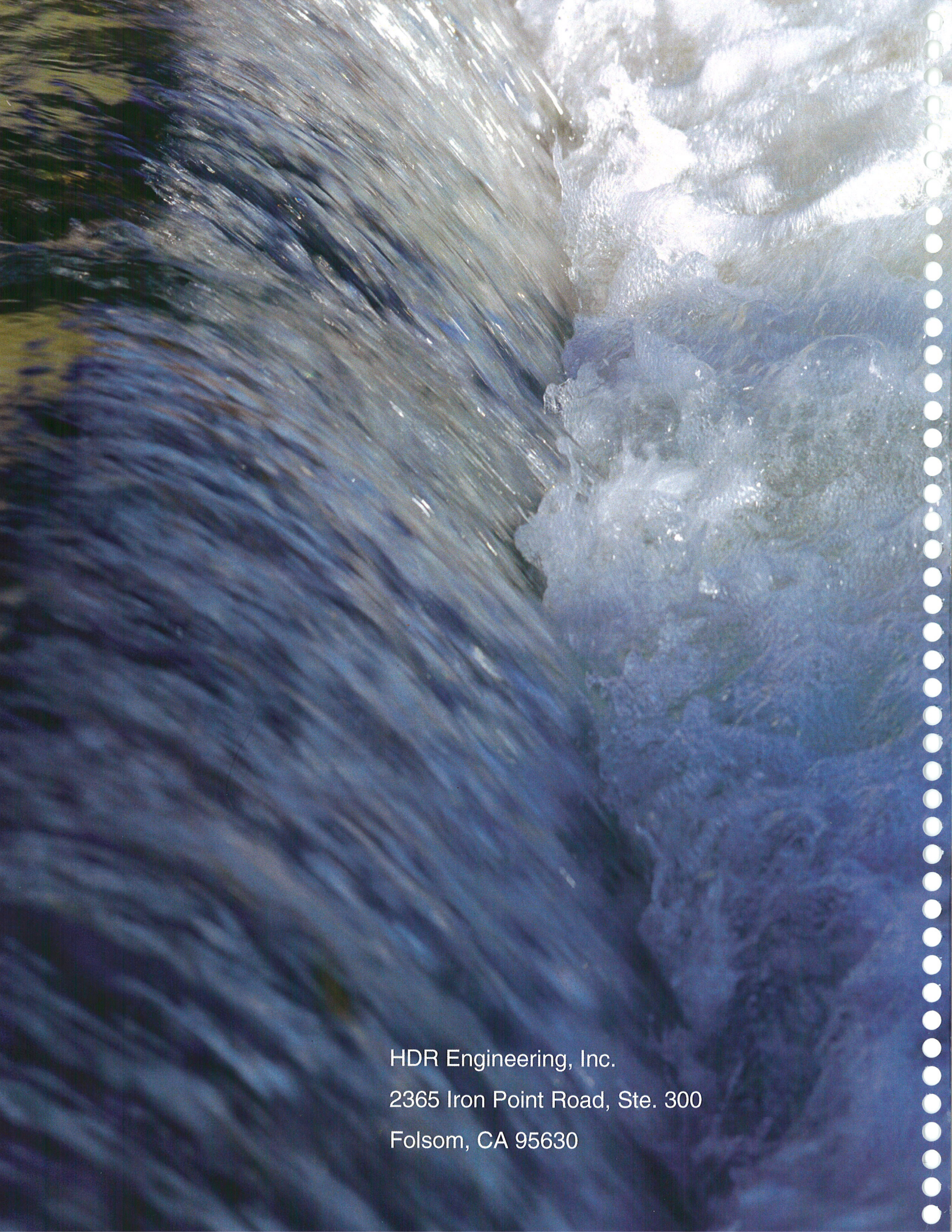
HDR

CITY OF LODI
SURFACE WATER TREAMENT FACILITY

PROPOSED NORTH ELEVATION

DATE
5/26/08

FIGURE
Figure 6



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